FEDERAL-STATE-PRIVATE
COOPERATIVE SNOW SURVEYS

WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES

Including Columbia River Drainage in Canada

Prepared by

U. S. DEPARTMENT of AGRICULTURE ★ SOIL CONSERVATION SERVICE

Collaborating with
CALIFORNIA DEPARTMENT of WATER RESOURCES
and
BRITISH COLUMBIA DEPARTMENT of
LANDS, FORESTS and WATER RESOURCES

AS OF
FEB. 1, 1971

TO RECIPIENTS OF WATER SUPPLY OUTLOOK REPORTS:

Most of the usable water in western states originates as mountain snowfall. This snowfall accumulates during the winter and spring, severol months before the snow melts and appears as streamflow. Since the runoff from precipitation as snow is delayed, estimates of snowmelt runoff can be made well in advance of its occurrence. Streamflow forecasts published in this report are based principally on measurement of the water equivalent of the mountain snowpack.

Forecasts become more accurate as more of the data affecting runoff are measured. All forecasts assume that climatic factors during the remainder of the snow accumulation and melt season will interact with a resultant average effect on runoff. Early season forecasts are therefore subject to a greater change than those made on later dates.

The snow course meosurement is obtained by sampling snow depth and water equivalent at surveyed ond marked locations in mountoin oreos. A total of about ten samples are taken at each location. The average of these are reported as snow depth and woter equivalent. These meosurements are repeated in the same location near the same dates each year.

Snow surveys ore made monthly or semi-monthly from January 1 through June 1 in most states. There are about 1900 snaw courses in Western United States and in the Columbis Basin in British Columbia. Networks of automatic snow water equivalent and related data sensing devices, along with radio telemetry are expanding and will provide a continuous record of snow water and other parameters of key locations.

Detoiled data on snow course and soil moisture measurements are presented in state and local reports. Other data on reservoir storoge, summaries of precipitation, current streamflow, ond soil moisture conditions at valley elevations are also included. The report for Western United States presents a brood picture of water supply outlook conditions, including selected streamflow forecasts, summary of snow accumulation to date, and storage in larger reservoirs.

Snow survey and soil moisture data for the period of record ore published by the Soil Conservotion Service by states about every five years. Data for the current year is summarized in o West-wide basic dota summary and published about October 1 of each year.

PUBLISHED BY SOIL CONSERVATION SERVICE

The Soil Conservation Service publishes reports following the principal snow survey dates from January 1 through June 1 in cooperotion with state water administrators, agricultural experiment stations and others. Copies of the reports for Western United States ond all state reports may be obtained from Soil Conservation Service, Western Regional Technical Service Center, Room 209, 701 N. W. Glisan, Portland, Oregon 97209.

Copies of stote and local reports may also be obtained from state offices of the Soil Conservation Service in the following states:

STATE	ADDRESS
Alaska	P. O. Box "F", Palmer, Alaska 99645
Arizona	6029 Federol Building, Phoenix, Arizona 85025
Colorado (N. Mex.)	12417 Federal Building, Denver, Colorado 80202
Idaho	Room 345, 304 N. 8th. St., Boise, Idaho 83702
Montana	P. O. Bax 970, Bozeman, Montana 59715
Nevado	P. O. Box 4850, Reno Nevada 89505
Oregon	1218 S. W. Washington St., Portland, Oregon 97205
Utah	4012 Federol Bldg., 125 South State St., Salt Lake City, Utah 84111
Washington	360 U.S. Court House, Spokane, Washington 99201
Wyoming	P. O. Box 2440, Casper, Wyoming 82601

PUBLISHED BY OTHER AGENCIES

Water Supply Outlook reports prepared by other agencies include a report for California by the Water Supply Forecast and Snow Surveys Unit, California Department of Water Resources, P. O. Box 388, Sacramento, California 95802 --- and for British Columbia by the Department of Lands, Forests and Water Resources, Water Resources Service, Parliament Building, Victoria, British Columbia

USDA-SCS-PORTLAND, OREG 1970

WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES

Including Columbia River Drainage in Canada

ISSUED

FEBRUARY 1, 1971

The Soil Conservation Service coordinates snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Corps of Engineers, Forest Service, National Park Service, Weather Bureau, Geological Survey, and other Federal Agencies, Departments of State Government, Irrigation Districts, Power Companies, and others.

The Department of Water Resources coordinates snow surveys in California.

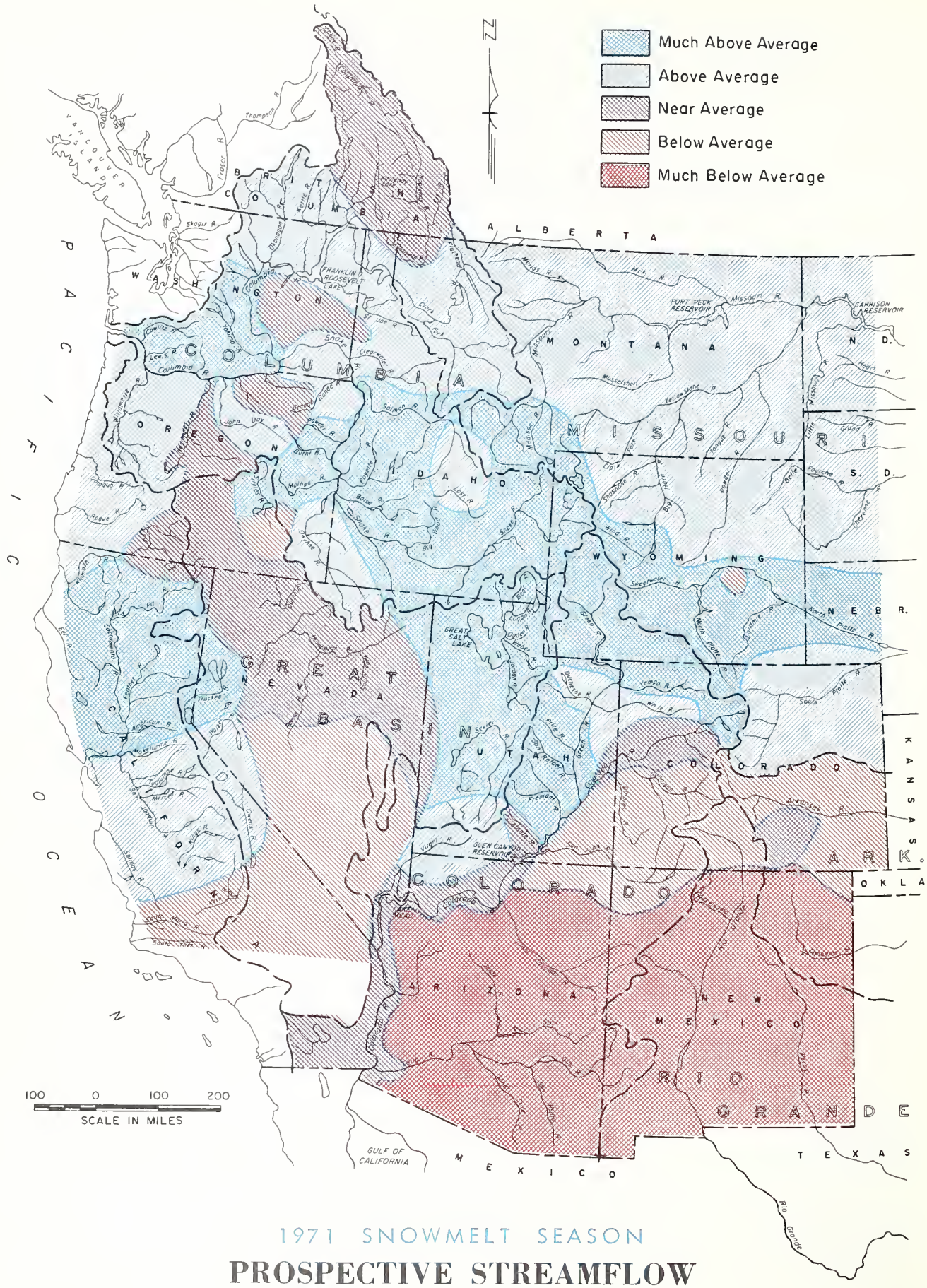
The Water Resources Service, Department of Lands, Forests, and Water Resources directs snow surveys in British Columbia.

This report was prepared by the Water Supply Forecasting Branch, Engineering Division, Soil Conservation Service, from data supplied by Snow Survey Supervisors of the Soil Conservation Service in the States of Alaska, Arizona, Colorado and New Mexico, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.

Data from California was supplied by the Chief, Water Supply Forecast and Snow Survey Unit, Department of Water Resources.

Data from British Columbia was supplied by the Chief, Hydrology Division, Water Investigations Branch, Department of Lands, Forests and Water Resources.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
KENNETH E. GRANT, ADMINISTRATOR



1971 SNOWMELT SEASON

PROSPECTIVE STREAMFLOW

AS OF FEBRUARY 1, 1971

USDA-SCS-PORTLAND, OREG. 1968

WATER SUPPLY OUTLOOK

1971 SNOWMELT SEASON
AS OF FEBRUARY 1, 1971

AVERAGE TO NEAR RECORD SNOWPACKS COVER MOST WESTERN WATERSHEDS. THIS CONDITION, COMBINED WITH GENERALLY EXCELLENT RESERVOIR STORED WATER, PROVIDES A VERY SATISFACTORY WATER SUPPLY OUTLOOK FOR MOST MAJOR IRRIGATED AREAS. WATER USERS IN ARIZONA, CENTRAL AND SOUTHERN NEW MEXICO WHO ARE ON NATURAL FLOW RIGHTS OR HAVE INADEQUATE RESERVOIR STORAGE RIGHTS CAN EXPECT LATE SUMMER SHORTAGES. STREAMS HERE ARE FORECAST AT ABOUT 15 TO 50 PERCENT RUNOFF.

January storms generally brought above average snowfall across the northern half of the western states, extending southward into northern Utah and Colorado. Snowfall for the month was less than average on most California and Nevada watersheds. In southern Utah, southern Colorado, Arizona and New Mexico snowfall during the month fell to 20 percent of average and even less.

An exceptionally warm mid-January storm, with rains even at high elevations in the mountains and which covered most of the West, resulted in unusually dense snows for this time of year. During this period a great portion of the valley and low elevation snow cover disappeared. In the Washington, Oregon and Idaho areas where low elevation snow had been exceptionally heavy prior to the stormy period, heavy runoff resulted. One example was on the Owyhee River where January inflow to Owyhee Reservoir was 7.5 times the average amount, filling the reservoir during January for the first time in 35 years.

Low elevation snow cover is still sufficiently heavy on various low elevation watersheds along the Snake River that, considering the frozen soils underlying the snow, that a potential flooding hazard still exists.

Numerous snow courses in the Cascade and Sierra Nevada mountains of the west coast states, on watersheds of the Snake River in Idaho, in central and northern Utah, northern Colorado, in Wyoming and southwest Montana already equal and in some cases considerably exceed their normal April 1st snow cover.

The California Department of Water Resources reports that the snowpack on Cascade and Sierra watersheds is 150 percent of normal for this date. February 1 storage in the State's major reservoirs was normal or above in all hydrographic areas. Runoff for the water year to February 1 was above normal in all areas except the Lahontan, which was 90 percent of normal. Overall, present prospects for excellent water supplies being available to California water users this summer is very good.

While the snowpack is heavy in the major water producing areas of the United States portion of the Columbia Basin, it falls off to average or slightly better on the upper Columbia and Kootenay rivers in British Columbia, as reported by the British Columbia Water Resources Service, Department of Lands, Forests and Water Resources. In western B.C. the snow cover increases to near 150 percent on the Similkameen.

Montana's snowpack varies from 120 percent on the Missouri main stem to near 175 percent on the Jefferson River. Moving south into Wyoming the snowpack continues well above average on most watersheds, ranging from about 150 to 180 percent on the Yellowstone, Shoshone, Wind and North Platte rivers. It is about 125 percent in the Big Horn Mountains and has only one small pocket of below average conditions near Casper.

In Colorado, the snowpack on streams east of the Continental Divide drops off to near or a little above average on the South Platte and a little below average on the Arkansas River. In New Mexico snow cover is deficient on the Rio Grande River and practically non-existent on the Canadian, Pecos and Mimbres rivers. In the Upper Colorado River Basin snow cover is excellent (near 130 to 160 percent) except in the Four Corners area where it falls to about 90 percent. With inflow to Lake Powell forecast at 117 percent average, prospects for water and power interests in the Lower Basin are also good.

Storage in Arizona's principal reservoirs is sufficient to assure a good water supply for the major irrigated areas in spite of the very low runoff anticipated.

Generally well above average snowpack in the Great Basin, combined with good reservoir supplies assure good to excellent water sup-

SUMMARY OF SNOW WATER EQUIVALENT MEASUREMENTS FEBRUARY 1, 1971

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
MISSOURI BASIN		
Jefferson	182	173
Madison	143	154
Gallatin	99	145
Missouri Main Stem	150	120
Yellowstone	147	147
Shoshone	182	169
Wind	198	182
North Platte	117	171
South Platte	69	116
ARKANSAS BASIN		
Arkansas	67	97
Canadian	---	---
RIO GRANDE BASIN		
Rio Grande (Colo.)	98	72
Rio Grande abv.Otowi Bridge	106	76
Pecos	16	4
COLORADO BASIN		
Green (Wyo.)	153	153
Yampa - White	106	160
Duchesne	159	141
Price	119	138
Upper Colorado	92	133
Gunnison	89	109
San Juan	138	90
Dolores	98	114
Virgin	328	129
Gila	28	12
Salt	105	30
GREAT BASIN		
Bear	159	181
Logan	166	180
Ogden	159	172
Weber	131	157
Provo - Utah Lake	134	132
Jordan	117	148
Sevier	168	133
Walker - Carson	115	134
Tahoe - Truckee	171	155
Humboldt	60	111
Lake Co. (Oregon)	134	112
Harney Basin (Oregon)	81	116
UPPER COLUMBIA BASIN		
Columbia (Canada)	155	108
Kootenai	170	104
Clark Fork	142	136
Bitterroot	215	155
Flathead	185	135
Spokane	140	140
Okanogan	141	132
Methow	133	151
Chelan	177	145
Wenatchee	134	166

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
SNAKE BASIN		
Snake above Jackson, Wyo.	140	162
Snake above Hiese, Idaho	135	167
Snake abv.American Falls Res.	140	165
Henry's Fork	145	155
Southern Idaho Tributaries	100	167
Big and Little Wood	180	180
Boise	130	175
Owyhee	65	100
Payette	115	170
Malheur	96	156
Weiser	140	190
Burnt	99	155
Powder	124	170
Salmon	140	160
Grande Ronde	122	132
Clearwater	145	145
LOWER COLUMBIA BASIN		
Yakima	123	160
Umatilla	112	108
John Day	98	137
Deschutes - Crooked	135	130
Hood	169	168
Willamette	221	159
Lewis	309	192
Cowlitz	228	182
PACIFIC COASTAL BASIN		
Puget Sound	189	166
Olympic Peninsula	204	141
Umpqua - Rogue	185	128
Klamath	192	107
Trinity	120	145
CALIFORNIA CENTRAL VALLEY		
Upper Sacramento	130	160
Feather	150	175
Yuba	165	185
American	145	160
Mokelumne	140	155
Stanislaus	135	155
Tuolumne	110	130
Merced	125	125
San Joaquin	135	135
Kings	120	120
Kaweah	145	130
Tule	135	95
Kern	95	95

Data for California Watersheds supplied by Dept. of Water Resources, and for British Columbia Watersheds by Dept. of Lands, Forests and Water Resources.

Average is for 1953-67 *period.* California averages are for the period 1931-65.
Based on Selected Snow Courses determined by Distribution within the Basin, Length of Record and Repetitive Monthly Measurement Schedules.

plies for all major irrigated areas of Utah and Nevada.

Storage in principal irrigation reservoirs is near average or above in all states of the West except New Mexico and Washington. Storage will be no problem in Washington, but above normal storms are needed in New Mexico to offset the low storage and anticipated low runoff.

MISSOURI BASIN

Snowfall on the upper Missouri River and its tributaries in Montana has been well above average during the first part of the snow accumulation season. It has been particularly heavy in southwest Montana drainages where the present pack shows record or near record amounts. The snow ranges from about 120 percent of average on the Missouri main stem to 173 percent average on the Jefferson River.

Moving south into Wyoming the snowpack continues above average. It is about 125 percent in the Big Horn Mountains and ranges from near 150 percent on the Yellowstone, 170 percent on the Shoshone and North Platte rivers, to over 180 percent on the Wind River.

In Colorado the snow drops off to near average or a little above on tributaries to the South Platte. Moisture in soils underlying the snowpack is generally average or a little wetter than usual, particularly in Montana.

Anticipated flow of streams in Montana and Wyoming range from about 110 percent to 160 percent. Heaviest flows - about 140 to 160 percent - are expected from the North Platte, Wind River and southwest Montana streams. Tributaries of the South Platte are forecast to flow at near 120 to 130 percent.

Water outlook for the Belle Fourche and Cheyenne rivers is excellent.

Carryover reservoir storage is about average in Montana, 87 percent average on Wyoming's Wind River, 164 percent on the North Platte and near 150 percent in Colorado on the South Platte.

ARKANSAS BASIN

The Arkansas River snowpack is generally near but below normal. Although the Arkansas River at Salida is expected to yield near 20 percent less than average flow, the water outlook is not expected to cause any major shortages.

Storage in John Martin Reservoir on the Arkansas River is not favorable, with only 18 percent of average. In New Mexico on the Canadian River, storage in Conchas Reservoir is 94 percent of average.

Mountain soil moisture is generally near an average condition.

RIO GRANDE BASIN

The snowpack is deficient over all watersheds of the Rio Grande Basin. On the upper headwaters in Colorado it is about three-fourths average, and decreases to the south. On the Pecos River in New Mexico it is nearly nonexistent, with only a little snow at the highest elevations. Present cover on the Pecos is only 4 percent of average, with some courses showing minimum of record.

Mountain soil moisture conditions are near average in Colorado, but drier than usual in New Mexico.

Flow of the Rio Grande near Del Norte, Colorado is expected to be about 20 percent less than average. Inflow to the river system from the Chama and Conejos rivers should also be near three-fourths of the usual contribution. Surface runoff water supplies for the Pecos are expected to be considerably less favorable, with a forecast of only 50 percent average.

Carryover storage is essentially average in Elephant Butte Reservoir, while on the Pecos River it is less than normal.

COLORADO BASIN

The present snow cover in the Upper Colorado River Basin is very favorable in most areas. It varies from a low of 90 percent average on the San Juan River to a high of 160 percent in the Yampa-White river area of northern Colorado. Tributary streams in Utah carry a snowpack which generally ranges between about 130 and 140 percent average. In Wyoming, on the upper Green River, the snow is a little heavier, running a slightly above 150 percent of the usual pack.

The generally favorable snowpack, combined with soil moisture conditions which are near average or above in most areas, provide a satisfactory to excellent water supply outlook for the coming summer. Prospective runoff is lowest in the Four Corners area on watersheds of the San Juan, Gunnison and Dolores rivers, and on the Colorado below confluence with the Gunnison. From 10 to 20 percent less than average streamflow is expected here.

Prospects for inflow to the upper basin from the White and Duchesne rivers ranges from about 15 to 30 percent above average. Higher flows are expected to come from the Green River in Wyoming, from the Little Snake and Yampa rivers, as well as most smaller tributary streams in Utah. Forecasts for these streams generally range from 140 to 160 percent average. April-July inflow to Lake Powell is forecast at 7,610,000 acre-feet, or 117 percent average. Storage in irrigation reservoirs is well above average.

SELECTED STREAMFLOW FORECASTS APRIL - SEPTEMBER as of FEBRUARY 1, 1971

STREAM AND STATION	FORECASTS THIS YEAR		LAST YEAR'S FLOW IN (1,000 A.F.)
	FLOW IN (1,000 A.F.)	PERCENT OF AVERAGE	
UPPER MISSOURI			
Jefferson at Sappington, Montana			
Madison near Grayling, Montana 1/			
Gallatin near Gateway, Montana			
Smith River near Eden, Montana			
Sun at Gibson Dam, Montana 3/			
Belt near Monarch, Montana			
Marias near Shelby, Montana 4/			
Missouri near Lundusky, Montana 2/			
S. F. Musselshell above Martinsdale, Montana			
Milk near Eastern Crossing, Montana			
Yellowstone at Yellowstone Lake Outlet, Wyo.(Apr.Oct.)	1,100	132	
Yellowstone at Corwin Springs, Montana			
Clark Cork at Chance, Montana			
Shoshone, Inflow to Buffalo Bill Res., Wyo.	1,000	123	
Wind at Dubois, Wyoming	136	136	
Wind at Riverton, Wyo.	950	146	
Bull Lake near Lenore, Wyoming	236	132	
Tensleep near Tensleep, Wyoming	82	111	
Tongue near Dayton, Wyoming	117	114	
Yellowstone at Miles City, Montana 5/			
Missouri near Williston, N. Dakota 6/			
PLATTE			
North Platte at Saratoga, Wyoming	880	159	
Encampment near Encampment	197	155	
Laramie near Jelm, Wyoming 7/	146	140	
Big Thompson at Drake, Colorado	120	120	
Clear at Golden, Colorado	150	126	
St. Vrain at Lyons, Colorado	83	119	
Cache LaPoudre near Fort Collins, Colorado 8/	255	119	
ARKANSAS			
Arkansas at Salida, Colorado 9/	250	81	
Cucharas near LaVeta, Colorado	13	108	
Purgatoire at Trinidad, Colorado	50	109	
RIO GRANDE			
Rio Grande near Del Norte, Colorado 10/	350	80	
Conejos near Mogote, Colorado 11/	150	82	
El Vado Res., Inflow, New Mex. (March-July)	142	75	
Rio Grande at Otowi Bridge, New Mex. 12/ (March-July)	380	74	
Pecos at Pecos, New Mexico (March-July)	21	50	
UPPER COLORADO			
Granby Reservoir Inflow, Colorado 13/	300	137	
Colorado at Dotsero, Colorado 14/	1,450	105	
Roaring Fork at Glenwood Springs, Colorado 15/	700	112	
Colorado near Cameo, Colorado 16/	2,360	107	
Uncomphagre at Colona, Colorado	110	85	
Gunnison near Grand Junction, Colorado 16/	910	80	
Dolores at Dolores, Colorado	200	87	
Colorado near Cisco, Utah 16/ **	2,507	89	4,066
Green at Warren Bridge, Wyoming	470	145	
New Fork near Boulder, Wyoming	345	159	
Flaming Gorge Res., Utah, Net Inflow 17/ **	1,700	161	985
Yampa at Steamboat Springs, Colorado	400	154	
Yampa near Maybell, Colorado	1,270	149	
Little Snake near Dixon, Wyoming	420	162	
White near Meeker, Colorado	350	119	
Duchesne near Tabiona, Utah 18/ **	116	123	
Whiterocks near Whiterocks, Utah **	60	118	55

Forecasts in California provided by Department of Water Resources.
Average is for 1953-67 period except California. California is computed for 1916-65 period.
Forecasts assume average Effective Climate Conditions from Date Through Snow Melt Season.

Explanatory Notes on Forecasts listed on Inside Back Cover.
** April - September Period ** April - July Period *** May - July Period.*

SELECTED STREAMFLOW FORECASTS APRIL - SEPTEMBER as of FEBRUARY 1, 1971

STREAM AND STATION	FORECASTS THIS YEAR		LAST YEAR'S
	FLOW IN (1,000 A.F.)	PERCENT OF AVERAGE	FLOW IN (1,000 A.F.)
UPPER COLORADO (continued)			
Duchesne at Randlett, Utah **	372	142	
Scofield Reservoir, Utah, Net Inflow 19/ **	45	141	
Green at Green River, Utah 17/ **	3,860	150	2,970
Navajo Reservoir Inflow, New Mexico **	500	80	446
Animas at Durango, Colorado	380	92	
San Juan near Bluff, Utah 20/ **	730	82	698
Colorado, Inflow to Lake Powell, Arizona 21/ **	7,610	117	8,220
LOWER COLORADO			
Virgin near Virgin, Utah *	45	118	21
Little Colorado above Lyman, Arizona (January-June)	1.5	17	7
Gila near Solomon, Arizona (January-May)	31	26	55
Frisco at Clifton, Arizona (January-May)	16	27	28
Salt at Intake, Arizona (January-May)	98	35	162
Tonto above Roosevelt, Arizona (January-May)	8.5	20	13
Verde above Horseshoe Dam, Arizona (January-May)	95	55	111
GREAT BASIN			
Bear at Harer, Idaho	440	195	
Logan near Logan, Utah 22/ **	140	141	
Ogden, Inflow to Pine View Res., Utah 23/ **	160	170	105
Weber near Oakley, Utah **	158	145	111
Utah Lake, Utah, Net Inflow **	290	149	
Big Cottonwood near Salt Lake City, Utah **	50	148	38
Beaver near Beaver, Utah **	26	138	23
Sevier near Hatch, Utah **	40	121	22
Sevier near Gunnison, Utah **	58	187	68
Humboldt at Palisades, Nevada **	175	113	218
Truckee at Farad, California 26/			
East Carson near Gardnerville, Nevada			
West Walker near Coleville, California **	178	125	133
Donner und Blitzen near Frenchglen, Oregon (March-July)	45	83	
Silvies near Burns, Oregon (March-July)	137	136	
Chewaucan near Paisley, Oregon (March-July)	95	104	
Deep above Adel, Oregon (March-July)	80	113	
UPPER COLUMBIA			
Columbia at Revelstoke, British Columbia			
Kootenai at Libby, Montana			
Kootenai at Leonia, Idaho	9,650	105	
Blackfoot near Bonner, Montana			
Flathead near Columbia Falls, Montana 27/			
Flathead near Polson, Montana 27/			
Clark Fork above Missoula, Montana			
Bitterroot near Darby, Montana			
Clark Fork at Plains, Montana 27/			
Columbia at Birchbank, British Columbia 27/	46,200	100	
Priest near Priest River, Idaho			
Pend Oreille below Box Canyon, Washington			
Kettle near Laurier, Washington			
Spokane at Post Falls, Idaho 28/	3,500	111	2,839
Columbia at Grand Coulee, Washington 27/	74,050	107	
Okanogan near Tonasket, Washington			
Methow near Pateros, Washington			
Stehekin at Stehekin, Washington			
Chelan at Chelan, Washington 29/			
Wenatchee at Peshastin, Washington			

SELECTED STREAMFLOW FORECASTS APRIL - SEPTEMBER as of FEBRUARY 1, 1971

STREAM AND STATION	FORECASTS THIS YEAR		LAST YEAR'S
	FLOW IN (1,000 A.F.)	PERCENT OF AVERAGE	FLOW IN (1,000 A.F.)
SNAKE			
Snake above Palisades Res., Wyoming 30/	3,630	142	
Grey's above Palisade, Wyoming	570	157	
Salt above Palisade, Wyoming	490	153	
Snake near Heise, Idaho 30/	5,000	134	4,050
Henry's Fork near Rexburg, Idaho 31/			
Teton near St. Anthony, Idaho			
Big Lost near Mackay, Idaho 32/	210	125	203
Blackfoot Reservoir Inflow, Idaho			
Portneuf at Topaz, Idaho			
Salmon Falls Creek nr San Jacinto, Idaho			
Big Wood, Inflow to Magic Res., Idaho 33/ (March-July)	470	175	
Bruneau near Hot Springs, Idaho			
Owyhee Res., Net Inflow, Oregon (February-July)	499	114	418
Boise near Boise, Idaho 34/	2,400	154	1,658
Malheur near Drewsey, Oregon (February-July)	154	139	
Payette near Horseshoe Bend, Idaho 35/	2,700	147	2,066
Snake at Weiser, Idaho			
Imnaha at Imnaha, Idaho	364	119	
Salmon at Whitebird, Idaho	8,900	130	7,378
Grande Ronde at LaGrande, Oregon (March-September)	239	113	185
Clearwater at Spalding, Idaho	11,000	128	7,982
LOWER COLUMBIA			
Yakima at CleElum, Washington 36/			
Umatilla at Pendleton, Oregon (March-September)	207	100	
John Day, Middle Fork at Bitter, Oregon (March-July)	180	135	
Crooked near Post, Oregon (February-July)	195	113	
Deschutes at Benham Falls, Oregon 37/ **	400	102	
Columbia at The Dalles, Oregon 27/	120,000	114	
Hood near Hood River, Oregon 37/ **	333	118	
Willamette at Salem, Oregon 37/ **	5,076	108	
Lewis at Ariel, Washington 38/			
Cowlitz at Castle Rock, Washington			
NORTH PACIFIC COASTAL			
Dungeness near Sequim, Washington			
Umpqua, No., near Tokatee Falls, Oregon	192	109	
Rogue at Raygold, Oregon **	814	104	
Klamath Lake, Net Inflow, Oregon (February-September)	987	99	
Trinity at Lewiston, California **	850	138	434
CALIFORNIA CENTRAL VALLEY 39/			
Sacramento, Inflow to Shasta, California	2,200	124	1,364
Feather near Oroville, California	2,600	140	1,116
Yuba at Smartville, California	1,500	139	611
American, Inflow to Folsom Res., Calif.	1,800	137	816
Cosumnes at Michigan Bar, California	180	124	67
Mokelumne, Inflow to Pardee Res., Calif.	600	129	397
Stanislaus, Inflow to Melones Res., Calif.	800	111	590
Tuolumne, Inflow to Don Pedro Res., Calif.	1,250	105	1,045
Merced, Inflow to Excheque Res., Calif.	620	102	465
San Joaquin, Inflow to Millerton Lake, Calif.	1,340	112	907
Kings, Inflow to Pine Flat Res., California	1,220	105	871
Kaweah, Inflow to Terminus Res., California	270	100	204
Tule, Inflow to Success Res., California	50	85	32
Kern, Inflow to Isabella Res., California	365	87	317
ALASKA			
Chena at Fairbanks, Alaska			
Salcha near Salchaket, Alaska			

Forecasts in California provided by Department of Water Resources.
Average is for 1953-67 period except California. California is computed for 1916-65 period.
Forecasts assume average Effective Climate Conditions from Date Through Snow Melt Season.

Explanatory Notes on Forecasts listed on Inside Back Cover.
** April - September Period ** April - July Period *** May - July Period.*

In the Lower Colorado Basin the Virgin River should yield from 20 to 30 percent above average flows. In Arizona the water supply outlook is near normal for the major agricultural areas. However, seasonal runoff is expected to be much below average, with the deficit being largely offset by good reservoir carryover supplies.

Many Arizona snow courses are bare, with some of the higher elevation stations reporting the lowest snow cover on record. Snow is heaviest on the Verde watershed with a 50 percent normal cover, and lightest on the Gila where there is only 12 percent.

Salt River Project streams are expected to flow 40 percent average, while the Gila is predicted to yield one-fourth of normal. The Little Colorado is expected to flow at 17 percent average. Substantial pumping will be required on the Upper Gila and on the San Carlos Project, with less acreage irrigated than usual.

GREAT BASIN

Most areas of the Great Basin have snowpacks which are average or well above average. This, combined with well above average reservoir storage, assures good to excellent water supplies next summer for all major irrigated areas.

Normal or above-normal snowfall for the remainder of the season is needed to insure adequate water supplies for some smaller areas in Nevada and Oregon. In Nevada these include the Surprise and Fish Lake Valleys. In Oregon additional snow is desirable on the lower elevation sagebrush country of Malheur, Harney and Lake counties.

Snow cover is average to about 15 percent above average on the Humboldt drainage in Nevada and on the Chewaucan and Deep Creek drainages in Oregon. Snow in the Sierras is 155 percent in the Tahoe-Truckee Basin. It decreases to the south but is still 135 percent on the Carson-Walker drainages. In Utah the snowpack varies from about 130 percent to near twice normal amounts. Many snow courses on the Tahoe-Truckee and in northern Utah currently have as much or more snow than is ordinarily expected by April 1, near which time the snowpack usually accumulates to its greatest depth.

The exceptionally warm mid-January storm, with rains even at high elevations in the mountains, ripened the mountain snowpacks and removed valley and a considerable amount of low-elevation snow, particularly from south and east facing slopes.

Water users along the upper Humboldt can expect water supplies to be near 10 to 15 percent above normal. In the lower Humboldt below Rye Patch Reservoir the outlook is excellent. Rye Patch Reservoir has storage which is 248 percent of average and 93 percent of the reservoir capacity.

In addition to the expected heavy runoff in the Tahoe-Truckee, Walker and Carson drainages, storage in Tahoe is 139 percent average, while Bridgeport, Lahontan and Topaz reservoirs hold near 20 percent above average amounts.

In Utah the water outlook is also excellent. Forecasts on the upper Sevier River range from near average to 20 percent above. On the lower Sevier River and in central and northern Utah most streams are expected to yield near 140 to 200 percent of their usual amounts. Heaviest flows are expected on Salina Creek, Hobble Creek, Lost Creek and the lower Bear River. Reservoir storage is also excellent, generally ranging near 150 percent average.

COLUMBIA BASIN

A good to excellent water supply next summer is anticipated throughout the entire Columbia River Basin. All streams are expected to yeild average or greater flows. Heaviest flows are expected on tributaries to the Snake River and along the Cascades in southwestern Washington. Most of these streams have prospective flows ranging between about 135 to 175 percent of average.

Mountain snowfall was generally much above average during January. Warm rains at mid-month and again near the month's end which fell even at the higher elevations resulted in unusually dense snow for this time of year.

During these warm rainy periods a great portion of the valley elevation snow cover disappeared. On many watersheds the foothill and low mountain elevation snowpack was greatly reduced, contributing to heavy runoff. An example is on the Owyhee River where last month's heavy snowpack was reduced to the present average condition. January inflow to Owyhee Reservoir was $7\frac{1}{2}$ times the average amount, filling it in January for the first time in 35 years.

In Idaho along lower elevation watersheds of the Snake River there are still many streams that pose potential flood threats as a result of frozen soils beneath the snowpack and with unusually heavy snow cover. Among these drainages are the following: Willow-Sand creeks above Idaho Falls, Portneuf River above Ban-Croft, Malad River, Marsh and Montpelier creeks, Camas-Beaver creeks near Kilgore and the Little Wood River.

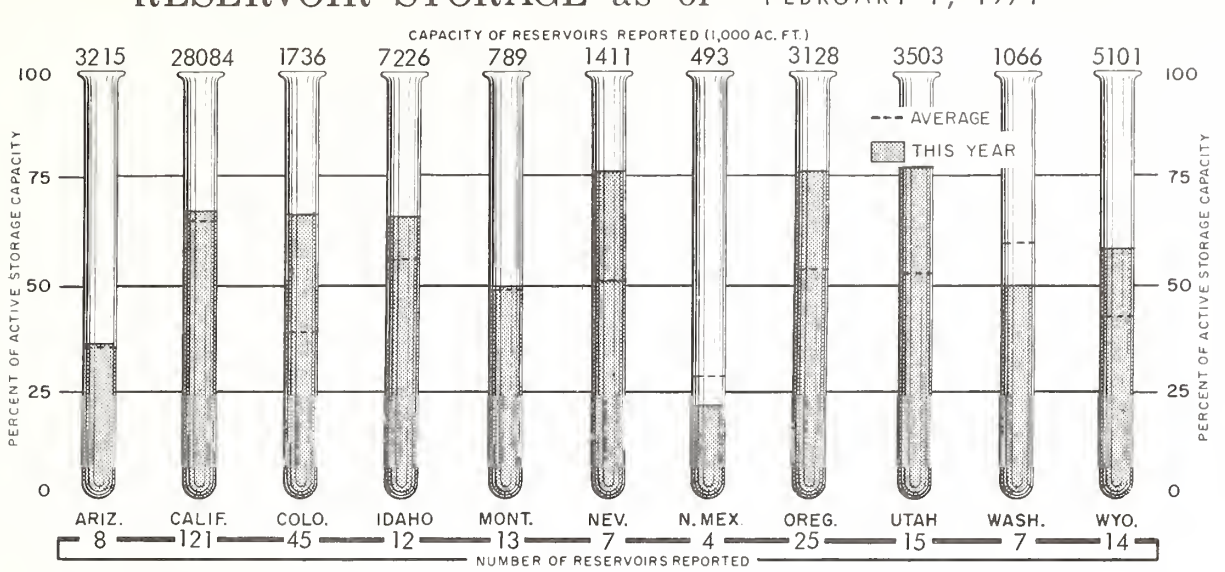
Snow accumulation to February 1 has been generally well above average, with all areas

STORAGE IN LARGE RESERVOIRS — FEBRUARY 1, 1971

BASIN AND NAME OF RESERVOIR	CAPACITY (1,000 A.F.)	STORAGE (1,000 A.F.)	STORAGE PERCENT AVERAGE
UPPER MISSOURI			
Belle Fourche	185	92	127
Boysen	550	320	79
Buffalo Bill	373	162	106
Canyon Ferry	2,043	1,613	101
Fort Peck	19,140	16,280	149
Garrison	24,500	19,351	176
Hebgen	377	266	157
Keyhole	192	108	332
Lake Francis Case	5,816	2,938	96
Lake Sharp	1,900	1,739	104
Oahe	23,630	18,899	174
Tiber	1,347	460	73
Big Horn	1,356	917	127
PLATTE			
City of Denver (5)	507	468	152
Colo-Big Thompson (3)	718	573	144
Glendo	784	341	126
Pathfinder	1,016	752	219
Seminoe	1,010	523	146
ARKANSAS			
Conchas	273	154	94
John Martin	354	15	18
RIO GRANDE			
Elephant Butte	2,195	369	99
El Vado	195	1	25
UPPER COLORADO			
Blue Mesa	830	540	---
Flaming Gorge	3,749	1,777	---
Navajo	1,696	938	---
Powell	25,002	12,228	---
LOWER COLORADO			
Havasu	619	545	101
Mead	26,159	16,801	101
Mohave	1,810	1,624	97
Salt River Res. (4)	1,755	952	102
San Carlos	985	12	12
Verde River Res. (2)	318	151	151
GREAT BASIN			
Bear	1,421	1,099	129
Lahontan	286	213	123
Rye Patch	179	166	248
Sevier Bridge	236	198	298
Strawberry	274	188	160
Tahoe	732	551	139
Utah	884	815	157
Willard Bay	193	175	---

BASIN AND NAME OF RESERVOIR	CAPACITY (1,000 A.F.)	STORAGE (1,000 A.F.)	STORAGE PERCENT AVERAGE
UPPER COLUMBIA			
Chelan	676	216	68
Coeur d'Alene	225	203	164
Duncan	1,347	327	---
Flathead	1,791	1,150	98
Hungry Horse	3,428	1,980	80
Kootenay	673	645	102
Lower Arrow	3,083	282	20
Noxon Rapids	335	332	104
Pend Oreille	1,155	303	59
Roosevelt	5,232	5,066	133
Upper Arrow	4,061	177	70
LOWER COLUMBIA			
Cougar	155	93	---
Detroit	300	189	450
Hills Creek	200	130	73
Lookout Point	337	123	262
Yakima Res. (5)	1,066	534	85
SNAKE			
American Falls	1,700	1,270	102
Anderson Ranch	423	311	137
Arrowrock	287	279	122
Brownlee	980	901	---
Cascade	653	447	161
Jackson	847	598	136
Lucky Peak	278	52	48
Owyhee	715	700	195
Palisades	1,200	966	143
PACIFIC COASTAL			
Clair Engle	2,448	1,911	87
Clear Lake	440	328	158
Nacimiento	350	157	96
Ross	1,203	895	94
Upper Klamath	584	398	110
CALIFORNIA CENTRAL VALLEY			
Almanor	1,036	644	86
Berryessa	1,602	1,469	91
Folsom	1,010	545	105
Isabella	570	154	86
McClure	1,026	518	89
Millerton	521	355	88
New Bullards Bar	930	888	190
Oroville	3,484	2,794	100
Pine Flat	1,013	536	82
Shasta	4,500	3,277	98

Reservoir Storage Data Provided by Bureau of Reclamation , Corps of Engineers, Geological Survey. and water using organizations. Data from California and British Columbia provided by Department of Water Resources and Department of Lands, Forests and Water Resources, respectively.



reporting average or greater amounts. With the exception of the upper Columbia and Kootenai rivers in British Columbia, where the snowpack is about 5 to 15 percent above average, the major water producing areas have a snow cover ranging from about a third above average to twice the usual pack. Snow on the Palouse and Umatilla rivers is about average to 10 percent above average.

Many snow courses already have as much or considerably more snow water than they ordinarily have on April 1st. On most watersheds, when the February 1st snowpack is in the range of 165 to 175 percent of average, the snow cover has reached the amount ordinarily measured on April 1. Many watersheds in the Snake River Basin and along the Cascades are in this condition.

ALASKA

Extremely heavy snowfall during the early part of the winter has resulted in a far greater than normal snowpack on the watersheds of the Chena and lower Tanana rivers. With much of the snowfall season still remaining, it is possible that a record snowpack will be measured in that portion of interior Alaska this season. This is in complete contrast to last year when snow cover in that region was the lightest on record.

Light to normal snow cover is the prevailing condition for most of the remainder of the State, although heavier snowfall has been reported in the mountains of southeast Alaska.

Very low temperatures have predominated throughout the State for the later part of December and most of the month of January. Very little additional snowfall was recorded during this period.

Soils on the watersheds of Interior Alaska are drier than normal.

CALIFORNIA

The California Department of Water Resources, coordinating agency for snow surveys and water supply forecasting in California, reports that the early statewide storms which deposited a snowpack averaging over 80 percent of the amount usually attained over the entire snow accumulation period, assured California water users of ample water supplies this year. Although below normal precipitation during January tended to normalize conditions, the State's snowpack is now 95 percent of the April 1 average or 150 percent of normal for this date. Other factors affecting water conditions in California are also above normal for this date in most areas. Although not always the case, water conditions south of the Tehachapi Mountains reflect statewide conditions, including this area's sources of major import.

Precipitation to date for this water year, as of February 1, was above normal in all major hydrographic areas, except the Colorado Desert area which was 20 percent of normal. Statewide, precipitation for the period October through January was 130 percent of average. Although only light and scattered rains occurred in October, a general nine-day storm during the first part of November helped end a major fire season. This was followed by a series of cold storms through December, resulting in a near record snowpack by January 1. The accompanying

regime which brought below freezing temperatures over the State through the first week of January was reversed in mid-January by moderate but warm rains which reached the mountain crests of the Sierra and Cascade ranges. This new regime brought record maximum temperatures to Southern California.

February 1 measurements from some 192 snow courses, 129 aerial markers, and 13 reporting snow sensors indicate that the State's snowpack was 150 percent of normal for this date and 95 percent of the April 1 average. Despite below normal precipitation during January, one-third of the snow courses measured in February were at or above their average April 1 snow water content. The mid-January high elevation rainstorm caused this pack to consolidate, bringing densities up to 45 and 50 percent. On February 1, the snowpack density is generally around 30 and 35 percent. In general, the distribution of California's snowpack is highest in the Central Sierra with the Yuba River Basin showing 185 percent of normal for February 1. This tapers off to the north and south with the Trinity and Kern River Basins showing 145 and 95 percent of normal for February 1, respectively.

Streamflow forecasts for the April-July period, assuming normal precipitation to occur the remaining of the season, call for Central Valley tributaries to average 120 percent of normal. The Sacramento and San Joaquin Valleys will average 135 and 105 percent of normal, respectively. April-July runoff forecasts are above normal for all major tributaries except the Tule and Kern River Basins which are 85 and 87 percent of normal, respectively.

Unimpaired runoff for the October through January period from California's major hydrographic areas was 185 percent of the 50-year average for this period. As is usually the case, distribution is from north to south with the high runoff from the North Coastal area at 230 percent of average and the low from the Lahontan area at 90 percent of average. Runoff of major streams in the Central Valley was 110 percent of the 50-year average, generally ranging from north to south with 165 percent of average for the Upper Sacramento River Basin and 80 percent of average for the Kaweah River Basin. Reflecting some snowmelt, January runoff of Central Valley streams was 130 percent of the 50-year average.

On February 1, the aggregate storage in 121 major reservoirs in California, with a combined capacity of 28,084,000 acre-feet, was 22,206,000 acre-feet. This amounts to 105 percent of normal storage for February 1 and 67 percent of the combined capacity. Storage in all major hydrographic areas was above normal for February 1 except in the Sacramento Basin which was normal.

EXPLANATION of STREAMFLOW FORECASTS

All flows are observed flows except as adjusted for: 1/ Change in storage in Hebgen Lake. 2/ Change in storage in Canyon Ferry and Tiber reservoirs. 3/ Change in storage in Gibson Reservoir and measured diversions. 4/ Change in storage in Two Medicine, Four Horns and Lake Francis reservoirs. 5/ Change in storage in Boysen and Buffalo Bill reservoirs.

6/ Change in storage in Boysen, Buffalo Bill, Canyon Ferry, Tiber, and Fort Peck reservoirs. 7/ Plus diversions to Cache la Poudre. 8/ Minus diversions from North Platte, Laramie, and Colorado rivers plus measured diversions above station. 9/ Change in storage in Twin Lakes and Sugar Loaf reservoirs minus diversions from Colorado River. 10/ Change in storage in Rio Grande, Santa Maria, and Continental reservoirs.

11/ Change in storage in Platoro Reservoir. 12/ Change in storage in El Vado Reservoir. 13/ Change in storage in Granby Reservoir plus diversions to Cache la Poudre and through Adams Tunnel. 14/ Changes as indicated in (13) plus Moffat Tunnel diversion. 15/ Plus diversions to Arkansas River.

16/ Change in storage in Blue Mesa reservoir. 17/ Change in storage in Flaming Gorge, Fontenelle and Big Sandy reservoirs. 18/ Plus diversion through Duchesne Tunnel. 19/ Change in storage in Scofield Reservoir. 20/ Change in storage in Navaho Reservoir.

2 21/ (Lee's Ferry) Change in storage in Flaming Gorge, Navajo, Lake Powell and Big Sandy reservoirs. 22/ Plus Utah Power and Light Company tailrace and and Logan, Hyde Park, and Smithfield canals. 23/ (Inflow record computed by U. S. Bureau of Reclamation.) 24/ Plus diversion by Weber-Provo Canal and change in storage in Wanship Reservoir. 25/ Change in storage in Deer Creek Reservoir, minus diversions through Duchesne Tunnel and Weber-Provo Canal, plus diversion through Salt Lake City Aqueduct.

26/ Change of storage in Lake Tahoe and Boca Reservoir. (Forecast by Truckee Basin Committee) 27/ Change in storage in any of these reservoirs above the station: Kootenai Lake, Hungry Horse, Flathead Lake, Pend Oreille Lake, F. D. Roosevelt Lake, Lake Chelan, Coeur d'Alene Lake, Brownlee and Noxon; and pumpage at Roosevelt Lake. 28/ Changes in storage in Coeur d'Alene Lake and diversions by Spokane Valley Farms Company and Rathdrum Prairie canals. 29/ Change in storage in Lake Chelan. 30/ Changes in storage for Jackson Lake and Palisades Reservoir above stations. 30/

31/ Change in storage in Henry's Lake, Island Park and Grassy Lake reservoirs and diversions between Ashton and Rexburg. 32/ Change in storage in Mackay Reservoir, and diversion in Sharp Ditch. 33/ (Combined flow Big Wood River nr. Bellevue and Camas Creek nr. Blaine.) 34/ Change in storage in Arrowrock, Anderson Ranch, and Lucky Peak. 35/ Change in storage in Cascade and Deadwood reservoirs. 36/ Change in storage in Keechelus, Kachess, and Cle Elum reservoirs plus diversion by Kittitas Canal. 37/ (Corrected to natural flow). 38/ Change in storage in Merwin, Yale, and Swift reservoirs. 39/ (Corrected for upstream impairments).

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
701 N.W. GLISAN, RM. 209
PORTLAND, OREGON 97209

OFFICIAL BUSINESS

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF AGRICULTURE

FIRST CLASS MAIL

FEDERAL - STATE - PRIVATE

COOPERATIVE SNOW SURVEYS

Furnishes the basic data necessary for forecasting water supply for irrigation, domestic and municipal water supply, hydro-electric power generation , navigation , mining and industry

"The Conservation of Water begins with the Snow Survey"